6 Water Resources

I. INTRODUCTION

This Water Resources chapter focuses on the issues relating to water resources for use and consumption, wastewater collection and treatment, and surface water stormwater management. This chapter, or element, of the Comprehensive Plan is a 2006 legislative requirement of the State of Maryland to insure that adequate public facilities are achieved by the various jurisdictions in their development process, to protect our valuable water resources for consumption and recreation, and to enhance our regional efforts in improving the health of the Chesapeake Bay. The ability to serve properties with public utilities, particularly water and sewer service, is a primary factor in determining existing land uses and future growth opportunities for any given jurisdiction. Public water and sewer are provided by the City of Havre de Grace through the Department of Public Works (DPW) and include water intake, treatment, and distribution and wastewater collection and treatment. In addition, stormwater management – for both the older portions of the City and in newer neighborhoods – is extremely important for the health of our surface water sources and, ultimately, the health of the Bay.

This chapter is divided into three sections: water treatment and distribution, wastewater collection system and treatment, and stormwater management and nutrient reduction. This is an expanded description of these topics, as required by state legislation, to develop a more in-depth approach to water resource protection while still allowing residential, commercial, and industrial growth. Passed in 2006 and referred to as House Bill (HB) 1141 *Land Use-Local Government Planning,* the Water Resources Element Law requires jurisdictions to: 1). Identify drinking water and other water resources that will be adequate for the needs of existing and future development proposed in the land use element of the plan, 2). Identify suitable receiving waters and land areas to meet the stormwater management and wastewater treatment and disposal needs of existing and future development in the land use element of the plan, and 3). To adopt a Water Resources Element (WRE) in the comprehensive plan on or before October 1, 2009, unless extensions [were] granted by Maryland Department of Planning (MDP) pursuant to law.[1] The goal of this Water Resource chapter is to ensure sufficient water supply and capacity and to identify suitable receiving waters for wastewater and stormwater impacts to support the City's planned land use.[2]

[1] The Water Resources Element: Planning for Water Supply and Wastewater and Stormwater Management, Maryland Department of Planning Models and Guidelines #26, p. 7

[2] Maryland Department of Planning 2008 Annual Report, p.10, Water Resource Elements

Havre de Grace provides its own water and sewer service to its municipal customers. Under required permits from Maryland Department of the Environment (MDE), raw water is withdrawn from the Susquehanna River at an intake just south of the Pennsylvania rail-line/Amtrak bridge, is treated, and distributed to city customers. Clean, treated effluent is released back into the Bay at the south end of town, as per a required surface water discharge permit also overseen by MDE. In this way, the City is its own, independent unit, providing these functions through highly-trained and dedicated operators in DPW.

The City also functions within a cooperative framework with Harford County. All municipalities coordinate with Harford County for determining growth areas and new service areas through the urban growth boundary of the Development Envelope. Havre de Grace – as well as the municipalities of Aberdeen and Bel Air – fall under the Harford County Water and Sewer Master Plan, which is updated biannually in the fall and spring. Treatment systems, major capital improvements, and new identified growth areas are all described in this plan and shows existing service areas and planned short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years) service areas. This arrangement was established in the 1970's in mutual agreement for expediency as opposed to having separate plans for each Harford County jurisdiction.

In addition to planning coordination, limited inter-operability exists between Havre de Grace and Harford County, specifically for water distribution. The City currently sells 1.4 million gallons per day (mgd) to Harford County to mix with other water sources to supply county customers. The County also has a sister plant adjacent to the City's water treatment plant on St. John Street for their own direct withdrawal from the Susquehanna River. Multiple water systems traverse this region for the purposes of redundancy, serving the greater Baltimore metropolitan area. A comprehensive study is underway to explore increased interdependent water systems governed by a regional water authority which could span county and municipal jurisdictions in the future.

The City of Havre de Grace is in good shape for providing an adequate water supply and sewage treatment capacity to accommodate future growth. The City is progressive in its recent planning, design, and construction of facilities for achieving Chesapeake Bay nutrient goals for wastewater effluent and has consistently been forward-thinking in maximizing its water treatment capacity. In addition, Havre de Grace has also successfully adopted its latest stormwater management ordinance to reflect changes in State requirements which were adopted legislatively in 2009. The following recommendations are provided for each section of this Water Resources Element chapter and followed by descriptions of existing and proposed facilities or expanded programs to meet current law. The recommendations are divided by section heading for ease of understanding their relationship to water distribution, wastewater collection, stormwater management, and the requirements of HB1141.

II. RECOMMENDATIONS

Water Treatment and Distribution

- Implement water treatment plant improvements, to include equipment renewal of 1954 valves, filter controls, and chemical feed systems with new technology which will provide efficiency, sustainability, and safety and facility improvements for operations and equipment housing.

- Continue to monitor capacity of water treatment plant to serve current city demand and future residential and commercial growth.

- Continue to coordinate with Harford County regarding semi-annual revisions to the Harford County Water and Sewer Master Plan for planning water service area extensions and timelines.

- Continue to participate in biannual water utility meetings with Harford County, other municipalities, and Aberdeen Proving Ground for coordination, to share and monitor progress with respect to meeting the demands of each service area.

- Continue to coordinate with Harford County for water buy-back as City capacity demand increases.

- Support the study/investigation of regional water authority with consideration for future impacts to City water service.

- Continue to implement equipment upgrades and renewal as needed which will provide efficiency, sustainability, and safety for water distribution system.

- Continue to support the interrelated water systems within Harford County to insure adequate drinking water within the City of Havre de Grace, Harford County, and the Baltimore Metropolitan Region.

- Revise ten-year capital improvement program for water infrastructure on a yearly basis so that needed capital projects continue to be identified and funded in a fiscally responsible manner.

- Continue to rely on the advisement of the Havre de Grace Water and Sewer Commission for the annual review of water and sewer rates, fee structure, and 10-year capital improvement program. Responsibilities include determining the strategic direction of the Water and Sewer Enterprise Fund (Fund 9) and establishing and monitoring operational goals and objectives.

- Continue to attract and retain highly-trained licensed professionals to operate the water treatment plant within the regulatory structure of Maryland Department of Environment Water Management Administration and federal law.

- Continue to coordinate with Harford County Government for land use planning and policy development to meet the intent of the State of Maryland's *Smart, Green, and Growing* initiative.

Waste Water Collection System and Treatment

- Operate state-of-the-art Havre de Grace WWTP Enhanced Nutrient Removal (ENR) facility completed in December 2009 to maximum efficiency to best meet Chesapeake Bay Restoration goals.

- Continue to monitor capacity of the wastewater treatment plant to serve current city demand and future residential and commercial growth.

- Continue to implement inflow and infiltration improvements to the sewer collection system which reduces the amount of surface and groundwater flowing into aging sewer lines, pipe intersections, and manholes.

- Continue to coordinate with Harford County regarding biannual revisions to the Harford County Water and Sewer Master Plan for planning sewer service area extensions and timelines.

- Continue to implement equipment upgrades and renewal as needed which will provide efficiency, sustainability, and safety for collection system and plant operations.

- Revise ten-year capital improvement program for sewer infrastructure on a yearly basis so that needed capital projects continue to be identified and funded in a fiscally responsible manner.

- Continue to rely on the advisement of the Havre de Grace Water and Sewer Commission for the annual review of water and sewer rates, fee structure, and 10-year capital improvement program. Responsibilities include determining the strategic direction of the Water and Sewer Enterprise Fund (Fund 9) and establishing and monitoring operational goals and objectives.

- Continue to attract and retain highly-trained licensed professionals to operate the wastewater treatment plant within the regulatory structure of Maryland Department of Environment Water Management Administration and federal law.

- Continue to operate the compost facility at the wastewater treatment plant to maximum efficiency and provide high-quality compost material for soil enhancement.

- Explore progressive options with public and private landowners for innovative land applications of treated effluent for irrigation and nutrient offloading.

- Continue to coordinate with Harford County Government for land use planning and policy development to meet the intent of the State of Maryland's *Smart, Green, and Growing* initiative.

Stormwater Management and Nutrient Reduction

- Administer and enforce the latest State Stormwater Management regulations as per the Stormwater Act of 2007, which insures environmental site design (ESD) to the maximum extent possible (MEP) in new development projects and 50% impervious surface reduction or the equivalent for redevelopment. Ordinance No. 912 Stormwater Management was passed May 3, 2010 and took effect June 17, 2010.

- Review stormwater management plans at the concept, site plan, and final plan phase of design to insure adequate retention of stormwater runoff from new development and redevelopment projects, as required.

- Develop a formalized internal development review process in which all departments review development plans for regulatory, local zoning, stormwater management, facility, and infrastructure sufficiency to be applied to all new development and redevelopment projects, regardless of scale.

- Continue to inspect stormwater facilities or the construction of on-site environmental site design applications as they are built during the development process.

- Continue to inspect existing stormwater management facilities on a yearly schedule to insure that they are maintained and functioning properly, with necessary reporting as required by Maryland Department of Environment on an annual basis.

- Align existing City development regulations, such as zoning, parking requirements, road code, etc., with stormwater management regulations to reduce the impervious surface runoff of future development.

- Continue to work with Harford County Soil Conservation District to review and approve sediment and erosion control plans prior to site grading in construction projects within the City, as required. Projects include all new development and redevelopment as well as City infrastructure improvements which exceed 5000 square feet or 100 cubic yards of soil disturbance.

- Develop a local sediment and erosion control ordinance so that inspection staff has enforcement capability to supplement MDE enforcement to insure that sediment and erosion control devices are properly installed and maintained during the development process.

- Continue to implement NPDES (National Pollutant Discharge Elimination System) Phase II requirements for Small Municipal Separate Storm Sewer Systems, as

outlined in the general discharge permit.

- Participate in the development of inter-jurisdictional watershed management plans for nutrient reduction to meet Maryland Tributary Strategy goals and federal Clean Water Act requirements.

- Identify and administer potential mitigation projects to meet anticipated nutrient reduction requirements, to include the direct storm drain discharge outfalls in the older portion of the City.

- Implement the *Lilly Run Improvement Plan* for flood relief/flood control in the interior portions of the City for the purposes of public safety and emergency access; protection of public and private property from damage; expedited floodwater exit; water containment; and environmental enhancement.

- Implement the priorities identified in the Havre de Grace Continuity of Operations Plan (COOP) from 2009 for disaster planning, to include flood emergencies.

- Continue to administer and improve on the voluntary Community Rating System for reduced flood insurance premiums for residents in the floodplain.

- Continue to administer required construction standards for all new buildings in the floodplain.

- Continue to administer and enforce Chesapeake Bay Critical Area regulations on shoreline parcels and land areas within 1000 feet of mean high water which are required in addition to stormwater management for protection of Chesapeake Bay water quality.

III. WATER TREATMENT AND DISTRIBUTION

The City of Havre de Grace serves its population's water needs by withdrawing raw surface water from the Susquehanna River, treating it, and then distributing it through a series of tanks, pumps, water mains, and smaller service lines to individual homes and businesses. The raw source of water for City of Havre de Grace is the Susquehanna River, with a withdrawal permit of 4 million gallons per day (mgd). Average daily water needs are 1.6 mgd currently (2009) for City residents and businesses, with a maximum day withdrawal rate of 2.0 mgd for calendar year 2009 (year ending December 31, 2009). As of July 1, 2009, the City sells 1.4 mgd of finished water to Harford County in addition to what it produces for local consumption.

The City's water plant daily appropriation is 4.0 mgd (30-day average) with a safe yield of 3.9 mgd; maximum day allowance is 5.0 mgd. Future expansion to 5.0 mgd is possible and included in the Harford County Water Resources Element of its Natural Resources Element Plan from May 2009. Havre de Grace is in a unique position to be located on such a large surface water source as the Susquehanna River. Its water treatment plant is

located on the City's waterfront at the north end of the downtown business district on St. Johns Street. Immediately adjacent is the Harford County water treatment plant, which also has a permitted daily appropriation of 4.0 mgd at this time. The sister plants operate independently but share some facilities such as the recently completed sludge handling facility located closest to the waterfront in the rear of the building complex. Because of regional development pressure, more emphasis will be placed on the Susquehanna River for supplying raw water for Harford County and the Baltimore Metropolitan Regional growth needs.

The City and Harford County have been involved in a mutually supportive agreement since 1980 when the County made major improvements to the City's water treatment plant in exchange for building its own plant adjacent to the City's. A forty-year contract was established to have Harford County lease the land owned by the City for building the adjacent plant; to have the County make necessary improvements to the City's aging facility; and the right for any remaining water supply from the City's plant to be utilized by Harford County. A water buy-back arrangement was built into the contract so the City would be able reduce its obligation to Harford County as its own needs increased with development. Both water treatment plants have their own raw water intakes located south of the Amtrak Railroad at the mouth of the Susquehanna River and are regulated by the Maryland Department of the Environment. Other water intakes located to the north of the railroad are regulated by the Susquehanna River Basin Commission headquartered in Pennsylvania as well as MDE, affecting regional water systems such as Baltimore City. This is important to the regional water systems that supply Harford County which uses water from the Susquehanna directly from its own plant, the Havre de Grace treatment plant, and the Baltimore City water system.

The Havre de Grace water treatment facility is a conventional mixed-media filtration plant with chemical addition, flocculation, and sedimentation as the initial processes for treating the raw water. The water then passes through mixed-media filters, is disinfected, fluoridated, and sent into the distribution system for consumer use. As a surface water source, the raw water from the Susquehanna River is expensive and highly-treated due to the water's turbidity, requiring advanced technology for plant operations. Ten licensed operators run the plant 24 hours a day, supplying potable water to City customers. Residual sediment is processed in the shared, three-story sludge handling facility and collected for land application. Necessary plant improvements are ongoing in three phases: phase I has been completed which included purchase and installation of a new generator, finished water pumps, and carbon feed system; phase II includes comprehensive valve replacement for filter valves from 1954 and new filter controls; and phase III includes new liquid chemical feed systems and substantial building improvements. Both phases II and III are engineered and ready to proceed for construction bids at this time.

The water distribution system is divided into three pressure zones, which include the downtown, older portions of the City; the newer neighborhoods located at the higher elevations, such as Grace Harbour and Bulle Rock residential community; and a lesser "drop-down" zone at Chapel Terrace and portions of Bayview Estates. A fourth pressure

zone may be configured in the future to serve the Mixed Office Employment area at the I-95/MD 155 interchange. Three storage towers work in tandem to supply reserve water storage for the system. The City's distribution system consists of 4", 6", 8", and 12" water mains throughout the older portions of town, with primarily 8" lines in the newer subdivisions. Utilizing a comprehensive Water System Master Plan developed in 1998 by MRA engineering firm, the City determines capital improvement priorities in a ten-year budget program to plan and fund needed long-term improvements. These improvements include older waterline replacements, relining of water lines, and valve replacements to ensure upgraded facilities in an aging system and to ensure adequate supply pressure systemically as new development occurs.

As part of the Harford County development envelope, the City is identified as a growth area and it is necessary to estimate water capacity needs for planned development projects. The following table (Table 6.1) shows anticipated water treatment plant capacity needs which includes current use requirements; capacity needed for potential infill projects and smaller known projects; large projects under construction; and growth areas. The methodology for calculating daily water needs in Table 6.1 is based on an allowance of 300 gallons per day per estimated dwelling unit (EDU) for residential projects. An allowance of 1,300 gallons per day per acre was used for estimated commercial demand[3]. These residential and commercial water requirements are consistent with design guidelines used by the City in water supply capacity management plans required by MDE. The information in this table is based on residential development capacity calculated in the Municipal Growth Element as of January 1, 2010 and estimates for identified growth areas for full build-out of the 2004 Comprehensive Plan Areas.

Table 6.1 includes water capacity estimates for all planned projects and growth area identified in 2004 and will allow for build-out to year 2025. The numbers indicating planning areas on the water services map coincide with those listed on Table 6.1 for visual referencing. Several projects are already incorporated in the City, such as Bulle Rock Planned Adult Community, Scenic Manor, and Greenway Farm. Other smaller known projects, such as Ivy Hills and St. Johns Commons are accounted for in the in-fill capacity allowance. Projects such as Grace Manor and Havre de Hills are completely built out at this time and included in the current use requirements in the water capacity table. Several developments located outside of City limits – Shawnee Brooke, Havre de Grace Heights, and Susquehanna River Hills – are included for future water capacity only in the event that they have reduced well yields that require public water in the future.

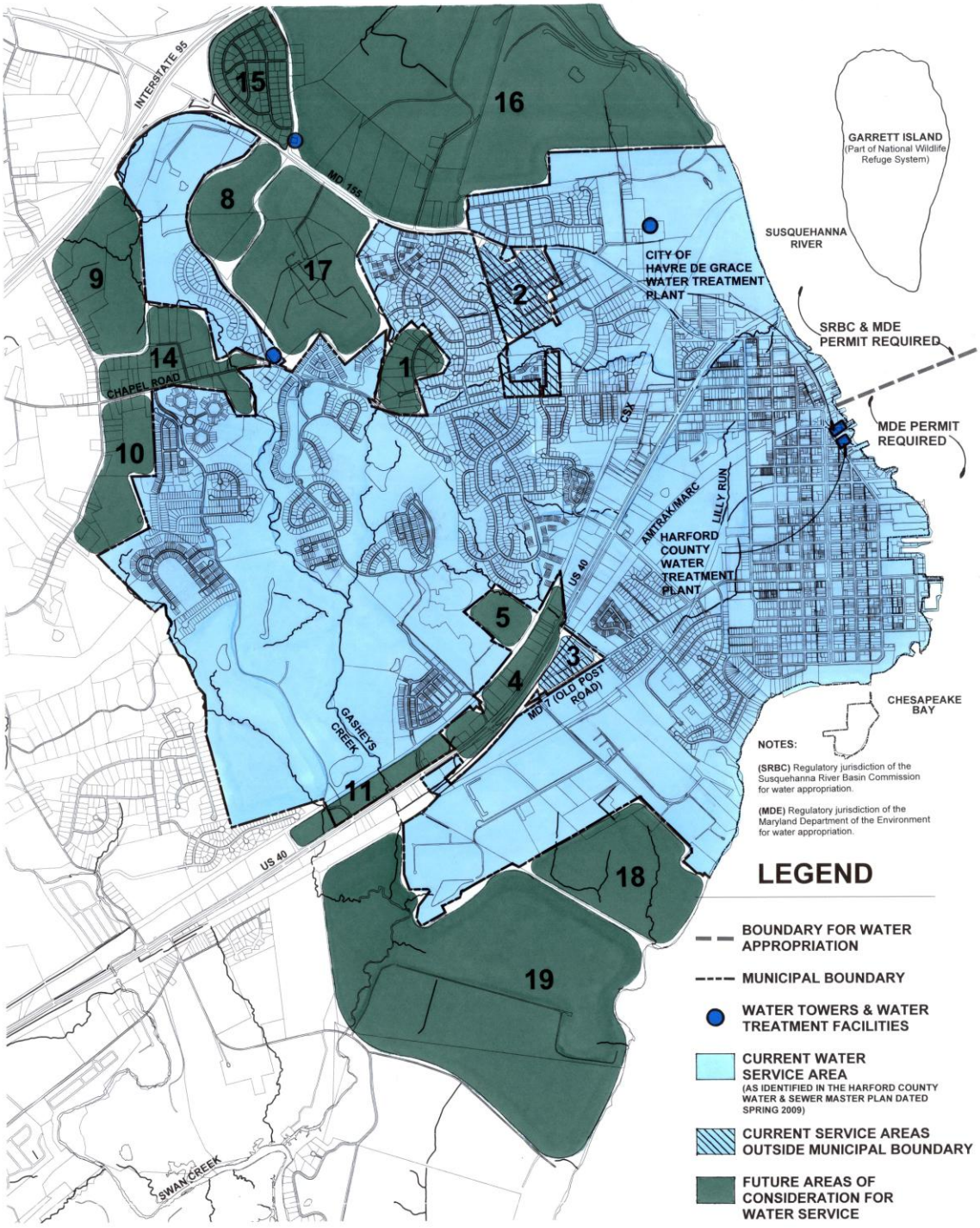
[3] Based on Water Supply Capacity Management Plan generalized estimates which balance average day and maximum day demand (270 gpd vs. 270 gpd x 1.2 for maximum day demand of 324 for residential and 1,200 gpd per acre vs. 1,200 average vs. 1,440 maximum day demand for commercial).

TABLE 6.1
COMPREHENSIVE PLAN ESTIMATED WATER CAPACITY NEEDS

Planning Area	Average Day (Gallon/Day)	Subtotals by Area
Current Use Requirements*	*2,037,000*	*2,037,000*
Capacity Allowance for In-fill and Smaller Projects	*219,600*	*219,600*
Capacity Allowance for Major Projects in Developing Areas		
I-95 Interchange, Southeast Quadrant: Mixed Office Employment and Residential	*142,000*	
Bulle Rock Planned Adult Community (1,360 EDU's)	*408,000*	*550,000*
Capacity Allowance for Growth Areas (Green and Hatched Areas)		
1. Shawnee Brooke (21 existing homes)	*6,300*	
2. Havre de Grace Heights (35 existing homes or lots)	*10,500*	
3. Revolution Street Corridor	*Currently served but not within municipal limits*	
4. US 40 Commercial	*60,000*	
5. Lampson Property (70 EDU's)	*21,000*	
6. Scenic Manor (84 EDU's)	*25,200*	
7. Greenway Farm (573 EDU's)	*171,900*	
8. Green Properties	*53,000*	
9. Earlton Road (160 EDU's)	*48,000*	
10. Robinhood Road (96 EDU's)	*28,800*	
11. US 40 Commercial, Extended	*39,000*	
12. Bulle Rock Golf Course: *Clubhouse/Restaurant and Inn/Conference Center*	*52,000*	
13. Garrett Island	*N/A, open space*	
14. Chapel Road Communities (38 existing homes)	*11,400*	
15. Susquehanna River Hills (98 existing homes or lots)	*29,400*	
16. Arundel Quarry	*N/A, mining activity*	
17. Sion Hill (MET easement)**	*N/A, open space*	
18. Old Bay Farm (MET easement)**	*N/A, open space*	
19. Swan Harbor Farm	*N/A, open space*	
		556,500
Total for Current Use, In-fill, and Planning Areas	***3,363,100***	***3,363,100***

***Current use capacity is based on a maximum day demand for calendar year 2009/year ending December 31, 2009.**

****Maryland Environmental Trust easements have been placed on portions or all of these properties at property owner's request. Because they are adjacent to municipal boundaries, it is appropriate that the City of Havre de Grace include these properties for land use planning consideration.**



CURRENT & FUTURE WATER SERVICE AREAS

City of Havre de Grace Comprehensive Plan

Based on a current usage amount of 2.037 mgd maximum day demand in 2009 and future build-out of this plan as identified in Table 6.1, the City has sufficient capacity to serve future growth (safe yield capacity is 3.86 mgd). Currently, the City of Havre de Grace water treatment plant serves an estimated population of 14,515[4] people as of January 1, 2010 as well as local businesses, institutional uses, and industry. Based on past growth trends, it is estimated that the City will have an estimated population of 19,383 in 2025 (or 1,995 additional households). These are conservative estimates and do not account for any surges in growth based on new demand from the Army's Base Realignment and Closure Act (BRAC) initiative that significantly affects this region due to its proximity to Aberdeen Proving Ground (APG). Careful monitoring of water usage as development occurs will be ongoing and initiatives for conserving water – such as property owner education or utilizing treated effluent for lawn irrigation – should be explored to maximize resources.

The City has an adequate water supply that will continue to serve the City and future growth beyond the scope of this plan. Because the Susquehanna River is such a reliable source of raw water, the potential to expand plant capacity is possible, whether for immediate growth around Havre de Grace or to sell additional water for Harford County's growth needs. This will be an ongoing planning effort which includes the findings of the aforementioned Water Authority Study now in process. This study involves a full regional study of water sources of the Baltimore Metropolitan Region and their interrelationship as regional growth demands increase. The City will also continue to work directly with Harford County Government for biannual updates of the Harford County Water and Sewer Master Plan to ensure continued cooperation and long-range facilities planning as required by law.

Opportunities for additional water sources should be explored as the need for reliable water supplies are (and will continue to be) a growing necessity. Consideration for the Vulcan Materials quarry as a reservoir and ground water source would greatly enhance our supply options locally and would potentially improve the water quality of raw water for treatment. In the long-term, Havre de Grace could increase its role as a point of finished water supply to the broader region. This effort would need to be studied extensively and could proceed only after site mining is complete and with concurrence of private property owners.

As the water customer base grows, City staff will continue to coordinate with Harford County in a phased buy-back of its finished water at 100,000 gpd increments (which requires eighteen month notification) to ensure an adequate supply as demand grows. Past buy-backs occurred in 2004 (from 2.0 mgd to 1.7 mgd), 2007 (to 1.5 mgd), then 2009 (to 1.4 mgd). Staff members will also continue to consult with the Havre de Grace Water and Sewer Commission, which was established in 2008, to advise the Mayor and City Council on its long-range capital improvement program, operational cost structure, and rate setting. Through the Department of Public Works, professional operators will continue to oversee successful operations and high-quality water supply to City customers and skilled staff will implement ongoing improvements and oversight to the distribution system. Yearly federal reporting requirements offer the public a published report of finished water quality so that customers are assured that their water supply meets or exceeds water quality standards.

[4] Please see Municipal Growth Element for population estimates and methodology.

III. WASTEWATER COLLECTION SYSTEM AND TREATMENT

The City of Havre de Grace is in an excellent position for meeting its wastewater treatment plant capacity needs and new Chesapeake Bay requirements for nutrient removal. The City has completed constructing improvements to the wastewater treatment plant, which include enhanced nutrient removal (ENR) technology for significantly reducing nitrogen and phosphorus in the treated effluent that is discharged into the Bay as well as increased capacity for limited development. The 3.3 million gallon per day (mgd) expanded plant was completed in December 2009 and is equipped with the latest technology for meeting the Bay Restoration Act and ENR Strategy which requires annual average nutrient goals of effluent quality of total nitrogen (TN) at 3 mg/L and total phosphorus (TP) at 0.3 mg/L. These treatment plant upgrades put Havre de Grace at the forefront of technology and timeliness for achieving bay restoration goals.

The City of Havre de Grace owns and operates a system of gravity sewer lines, force mains, and pumping stations which collect household, commercial, and industrial effluent and send it to the wastewater treatment plant located at the southern edge of the city's shoreline. All improved properties within city limits are served by public sewer and are billed for this service on a quarterly basis. Prior to the latest wastewater plant improvements, the City maintained plant efficiency at a rated capacity of 1.89 mgd and met State effluent requirements with past improvements for secondary treatment in 1986 and biological nutrient removal (BNR) technology in 2002.

As part of the latest upgrades, Phase I improvements to the wastewater treatment plant were completed in March 2008 and allowed for planned capacity approved by Maryland Department of the Environment (MDE) to 2.3 mgd. Phase II completion of ENR implemented by an enhanced oxidation ditch process is the final phase of improvements which allows the plant to operate at rated design capacity to 3.3 mgd and achieve required goals set by the State of Maryland. These improvements are a direct result of new Chesapeake Bay nutrient goals passed in 2002 (immediately following the opening of the BNR plant) and the need for increased capacity for future growth. These facility improvements also included significant upgrades to the main pumping station located on Lafayette Street in the cultural district.

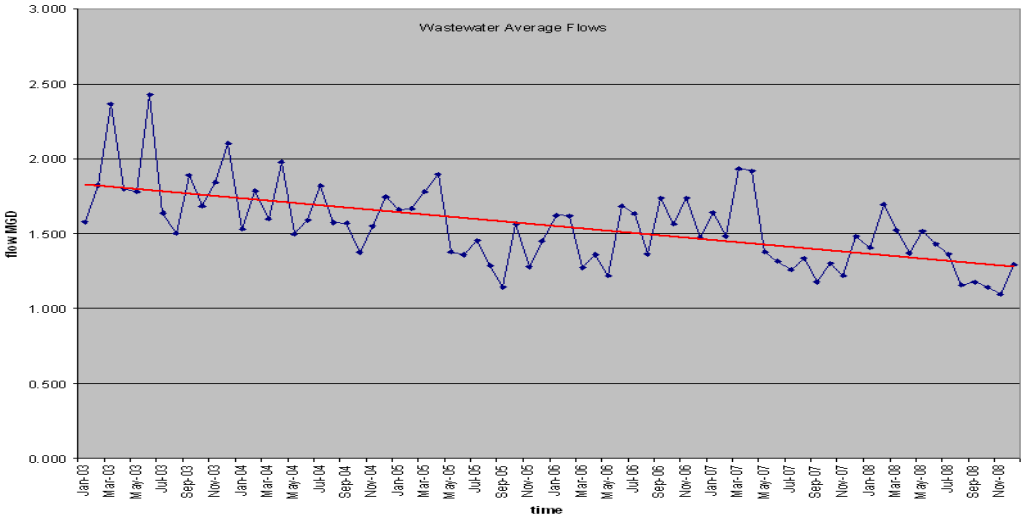
Havre de Grace constructed its first sewage collection system in 1910 as a combined sanitary and stormwater gravity flow system with raw sewage discharging directly into the Susquehanna River. Havre de Grace completed its first wastewater treatment facility in 1967 at the south shore of the city adjacent to the Maryland National Guard property. This plant was designed to provide primary treatment only (meaning that the solids were settled out and effluent disinfected before release into the Bay) and was originally intended to be built near the Concord Point Lighthouse on Lafayette Street, where the main pumping station is located. Improvements to the wastewater treatment plant were completed in 1986 to provide secondary treatment which enlisted biological processes for the treatment of the City's effluent and provided surge tanks for storm flow control, dewatering facilities, a lab, and a composting facility for the reuse of sludge. To meet State water quality goals set in 1987, Biological Nutrient Removal (BNR) was added to the facility to deal with nitrogen

and phosphorous removal. The latest upgrades to the plant reach the limits of technology for removing these nutrients, a leading cause of the degradation of the Chesapeake Bay.

The discussion of wastewater treatment does not just include the plant operations – the collection system is also very important. Havre de Grace has a system of gravity sewer lines, force mains, and pumping stations that need to be continuously maintained. Its series of sewer lines consist of pipes that have been recently installed from new development as Havre de Grace expanded its borders and those from a century ago. Older areas of the city suffer from aging sewer lines, which pose a particular challenge for maintenance. Disintegrating lines and aging pipe intersections allow for inflow of stormwater in rain events and cause the treatment plant to have to process high daily flows. Over the past five years, DPW staff have been aggressively working to eliminate such sources of inflow or flooding of the sewer collection system, commonly referred to as I&I for inflow and infiltration. Due to continued improvements, the City has regained measureable treatment plant capacity. These improvements include installation of waterproof manhole covers in floodplain areas, disconnection of roof leaders in older portions of the City, sealing of open manholes in areas of new construction, and disconnection of storm drain lines from the wastewater sewage collection system. The City continues to be vigilant in reducing inflow in an effort to reduce costs and increase plant efficiency.

With the expansion of the wastewater treatment plant capacity to 3.3 mgd, the City is in excellent position to serve future development in-fill and growth areas outlined in this plan. As of December 31, 2009, the City processed an average of 1.366 mgd per day, which is a 24-month rolling average. This is a substantial reduction from earlier rolling average data due to the focus on overall system efficiency through I&I reduction. A graph of the recent six year span (from January 2003 to December 2008) shows generalized trends for treatment amounts that the plant has handled.

GRAPH 6.1
WASTEWATER AVERAGE MONTHLY FLOW TRENDS, JANUARY 2003 TO DECEMBER 2008



Source: City of Havre de Grace Department of Public Works data supplied to Stearns & Wheler, LLC for yearly Wastewater Capacity Management Plans

In year 2003 at the height of a major residential growth period, the graph indicates the 12-month average (1.87 mgd) as approaching the plant's rated capacity of 1.89 mgd. Much of this was due to inflow and infiltration and, during this time, city staff worked closely on a project by project basis with the Harford County Health Department to ensure that the City did not exceed plant capacity. The City's DPW staff went into an aggressive program for reducing these I&I sources over the next several years and is evidenced in later 12-month averages on the graph (1.63 mgd for calendar year 2004, 1.49 mgd for 2005, 1.52 mgd for 2006, 1.45 mgd for 2007, and 1.35 mgd for 2008). These later trends indicate improvements and increased efficiency of the collection system. In addition, interim Phase I improvements from 2008 allowed for .4 mgd of additional capacity which provided the City with a buffer until the completed ENR plant came online at the end of 2009.

As part of the Point Source Strategy for the Bay, wastewater treatment plants are required to be upgraded through state-of-the-art ENR technology to meet concentrations of 3.0mg/L or less of TN and 0.3 mg/L or less of total phosphorous (TP). As of January 31, 2010, the Havre de Grace WWTP Enhanced Nutrient Removal facility was fully operational and exceeding nutrient reduction requirements. Operating the treatment plant with BNR, the City achieved an average total nitrogen (TN) from January to December 2009 of 7.1 mg/L. After the initial start-up period (from December 10, 2009 to January 31, 2010), the average TN from February has been less than 2.0 mg/L[5], which is excellent performance. To continue to meet State requirements, nutrient load caps must be maintained at an annual average concentration of 4.0 mg/L TN and 0.3 mg/L TP[6] for a plant the size of Havre de Grace (> 500,000 gpd), with an annual cap for TN of 27,715 lbs/year and 2,079 lbs/year for TP based on a 2.3 mgd flow. Additional flow can be accommodated (up to 2.8 mgd) as long as the annual average nutrient levels stay within MDE requirements. Tables in Appendix A. show wastewater point source nutrient loading information of pounds per year with BNR from 2002 to 2009 and then implementation of ENR.

At a current flow of 1.366 mgd, the Havre de Grace WWTP facility has substantial capacity to serve a growing community as well as meet nutrient load requirements. As part of the Harford County development envelope, the City is identified as a growth area and it is necessary to estimate wastewater capacity needs for planned development projects. The following table (Table 6.2) shows anticipated wastewater treatment plant capacity needs which includes current use requirements; capacity needed for potential in-fill projects and smaller known projects; large projects under construction; and growth areas. An allowance of 270 gallons per day per estimated dwelling unit (EDU) is used for residential projects. For commercial flows, an allowance of 1,200 gallons per day per acre of commercial land is used. These residential and commercial unit flow values are consistent with the design guidelines used by the City in wastewater capacity management plans required by MDE. The information in this table is based on residential development capacity calculated in the Municipal Growth Element as of January 1, 2010 and estimates for identified growth areas for full build-out of the 2004 Comprehensive Plan Areas.

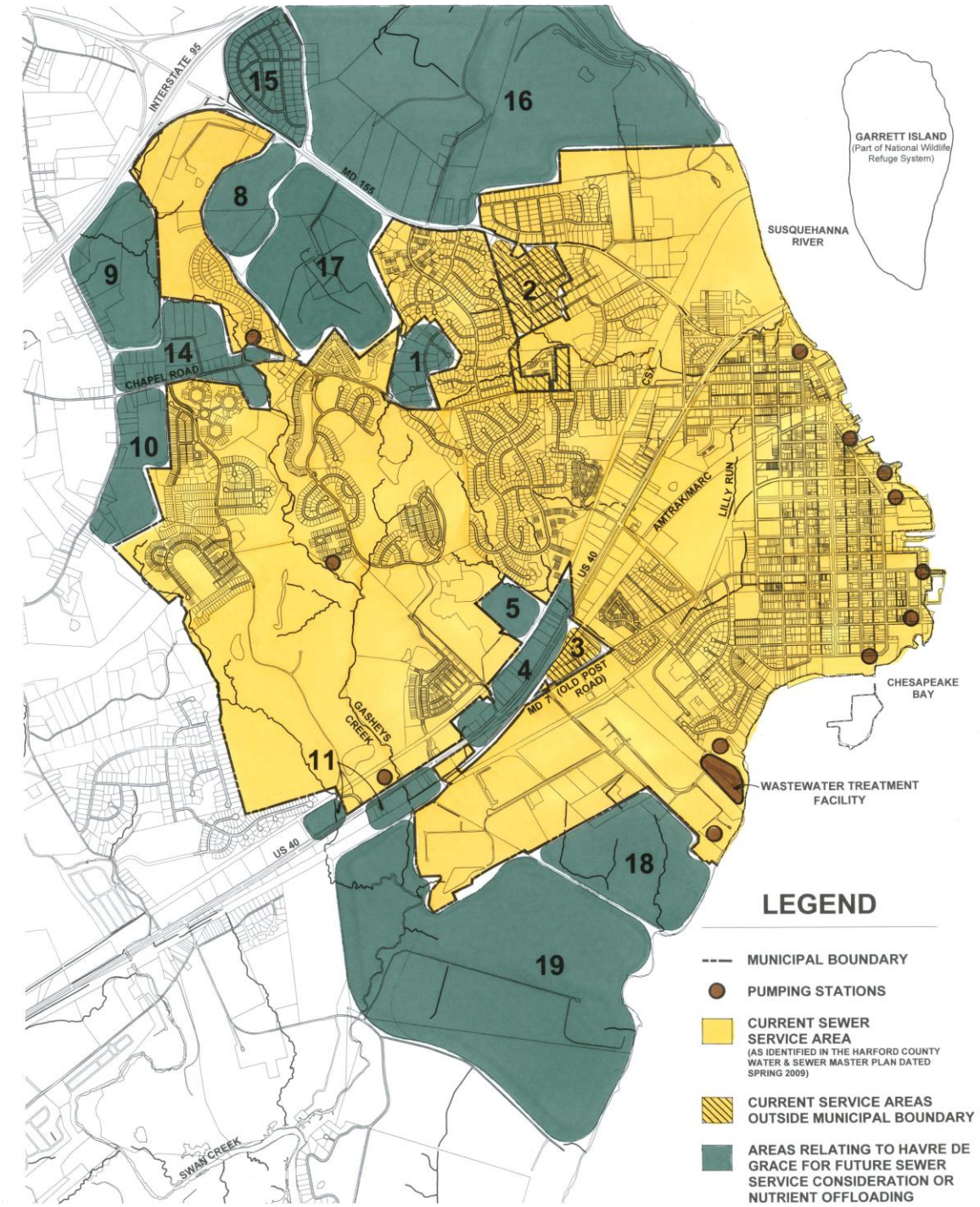
[5] From City of Havre de Grace Department of Public Works reporting requirements for MDE

[6] Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan. January 24, 2008

TABLE 6.2
COMPREHENSIVE PLAN ESTIMATED WASTEWATER CAPACITY NEEDS

Planning Area	Average Day (Gallon/Day)	Subtotals by Area
Current Use Requirements*	*1,366,000*	*1,366,000*
Capacity Allowance for In-fill and Smaller Projects	*197,640*	*197,640*
Capacity Allowance for Major Projects in Developing Areas		
I-95 Interchange, Southeast Quadrant: Mixed Office Employment and Residential	*131,000*	
Bulle Rock Planned Adult Community (1,360 EDU's)	*367,200*	*498,200*
Capacity Allowance for Growth Areas (Green and Hatched Areas)		
1. Shawnee Brooke	*Water only based on future need*	
2. Havre de Grace Heights	*Water only based on future need*	
3. Revolution Street Corridor	*Currently served but not within municipal limits*	
4. US 40 Commercial	*55,000*	
5. Lampson Property (70 EDU's)	*18,900*	
6. Scenic Manor (84 EDU's)	*22,680*	
7. Greenway Farm (573 EDU's)	*154,710*	
8. Green Properties	*49,000*	
9. Earlton Road (160 EDU's)	*43,200*	
10. Robinhood Road (96 EDU's)	*25,920*	
11. US 40 Commercial, Extended	*36,000*	
12. Bulle Rock Golf Course: *Clubhouse/Restaurant and Inn/Conference Center*	*47,000*	
13. Garrett Island	*N/A, open space*	
14. Chapel Road Communities	*Water only based on future need*	
15. Susquehanna River Hills	*Water only based on future need*	
16. Arundel Quarry	*N/A, mining activity*	
17. Sion Hill (MET easement)**	*N/A, open space*	
18. Old Bay Farm (MET easement)**	*N/A, open space*	
19. Swan Harbor Farm	*N/A, open space, However possible site for future nutrient offloading*	*452,410*
Total for Current Use, In-fill, and Planning Areas	***2,514,250***	***2,514,250***

*** Current use capacity figure is based on 24-month average for actual usage (average daily flow) for calendar year 2009/ year ending December 31, 2009.**
**** Maryland Environmental Trust easements have been placed on portions or all of these properties at property owner's request. Because they are adjacent to municipal boundaries, it is appropriate that the City of Havre de Grace includes these properties for land use planning consideration.**



CURRENT & FUTURE SEWER SERVICE AREAS

City of Havre de Grace Comprehensive Plan

Table 6.2 includes capacity estimates for all planned projects and growth areas identified in 2004 and will allow full build-out to year 2025. The numbers indicating planning areas on the sewer service map coincide with those listed on Table 6.2 for wastewater treatment plant capacity for visual referencing. Several projects are already incorporated in the City, such as Bulle Rock Planned Adult Community, Scenic Manor, and Greenway Farm. Other smaller known projects, such as Ivy Hills or St. Johns Commons, are accounted for in the in-fill capacity allowance. Projects such as Grace Manor and Havre de Hills are completely built out at this time and included in the current use requirements of the wastewater capacity table. Swan Harbor Farm is included in the sewer service map only for the potential for nutrient offloading in the future.

Currently, the City of Havre de Grace wastewater treatment plant serves an estimated population of 14,515[7] people as of January 1, 2010 as well as local businesses, institutional uses, and industry. Based on past growth trends, it is estimated that the City will have an estimated population of 19,383 in 2025 (or 1,995 additional households). As mentioned in the water treatment and distribution section, these are conservative estimates and do not account for any surges in growth based on new demand from the Army's BRAC initiative that significantly affects this region due to its proximity to APG.

As shown in Table 6.2, the City has wastewater capacity to accommodate the large development projects already being built, additional in-fill, commercial development, and the planning areas identified in 2004. Some areas identified on the map – such as Shawnee Brooke and Havre de Grace Heights – are included for water service in the event of failing wells, however full incorporation into the City with sewer service could also be considered based on public need. Future redevelopment projects and their impacts cannot be predicted at this time, such as potential relocation of the Harford Memorial Hospital facility and its current site reuse. These projects will be evaluated on a case-by-case basis to insure that adequate facility capacity for both water and sewer is available to accommodate them. The City will continue to work within the framework of the Harford County Water and Sewer Master Plan for service area planning with direct oversight by the Maryland Department of Environment and Harford County Health Department.

With the Havre de Grace WWTP Enhanced Nutrient Removal facility fully operational, the major capital projects are for continued inflow and infiltration reduction, replacement of older sewer lines, and other repairs relating to an aging collection system. Equipment upgrades and/or renewal will be identified and funded through the 10-year capital improvement program as needed to maintain service. Maximizing system efficiency is key for plant operations. In addition, inspection of new infrastructure as it is built is critical to ensure that new wastewater lines are constructed properly for reduced maintenance costs in the future.

From an operational standpoint, the City will continue to support highly-trained, licensed professionals to run the wastewater treatment facility and to retain skilled technicians and field crew. Operator training for ENR and general relicensing is ongoing and required by

[7] Please see Municipal Growth Element for population estimates and methodology.

the State and many of the staff members are highly specialized. In addition to the plant operations, a substantial compost facility is also located on the grounds, which transforms solids from the WWTP into compost for soil enhancement. As a compost facility, the Havre de Grace plant offers grade A material – the highest rating – which allows for home and garden use. This is recycling at its best, where biosolids are reused in beneficial land application for farm and local residents.

A progressive idea for future effluent reuse is for irrigation distribution through a separate system of "purple pipes" which is under review and regulatory development by the State of Maryland. This is, again, a beneficial reuse where potential treated effluent can be distributed to public or private property through a system of separate water lines for land application. This would provide irrigation and fertilizer directly to golf courses, public parks, or private lawns without the need for chemical fertilizers providing a mutually beneficial arrangement of nutrient offloading for the City as well as providing reduced costs for golf course owners and maintenance companies. Potential locations for this opportunity are many in this region, with Swan Harbor Farm immediately adjacent to the City or the Bulle Rock Golf Course and/or residential community. Such an arrangement would allow the City to maximize plant capacity, reduce the City's contribution to nutrient loading in the Chesapeake Bay, and provide a community benefit.

V. STORMWATER MANAGEMENT AND NUTRIENT REDUCTION

A basic, elemental question about the topics covered in this section is "why should we care about stormwater management and nutrient reduction?" To answer that, we have to understand the importance of water quality in relation to human health and clean drinking water sources, a beneficial environment for habitat and wildlife, and the overall health of our planet. In this section, concepts relating to tributary strategies, sediment and erosion control, point and nonpoint source pollutant loading, TMDLs (Total Maximum Daily Loads), nutrient reduction, and stormwater management will all be covered to show the interrelationship of different approaches for improving the quality of our waterways. In addition, the topic of flood control will also be covered since Havre de Grace is such a flood prone region. The health of our tributaries – streams, creek, and rivers – affect Chesapeake Bay water quality, and what humans do on land affects those tributaries and larger water-bodies directly. The goal of this section is to define the issues and strategies being used currently at all levels of government – national, state, and local – and to show the heightened level of concern and attention for addressing the problems facing the region and the Chesapeake Bay.

Control of stormwater runoff is an important function of local government. In developed areas – small cities like Havre de Grace – runoff comes from paved surfaces (roads, sidewalks, parking lots) and buildings (such as houses, shopping centers, industrial complexes, even sheds) during rain and snow events. These are referred to collectively as impervious surfaces. Due to the high density of development, there is little area for rainwater to infiltrate the soil naturally so the water runs off into streams and other tributaries. On a small scale, rainwater builds up velocity on paved surfaces, washing out soil and eroding stream banks, and causes nuisance complaints between neighbors for

misdirected downspouts and yard grading. On a large scale, it floods roadways and property, causing damage and threatening public safety. The goal of stormwater management is to successfully limit stormwater runoff as areas develop, to reduce flooding, and to improve water quality so that streams and major waterways are not adversely affected by human-made pollution – such as oil, chemicals, and trash – carried in the runoff. It is also to have as much water return to the soil, which filters it naturally and replenishes groundwater.

Stormwater management is critically important in maintaining the health of stream systems as land is developed. Related to stormwater management is the concept of nonpoint source loading which describes the amount of pollutants that come from the impervious surface created by development. As with Havre de Grace, more intensive land uses in towns, cities, and suburban areas have a great degree of impervious surface due to high density of buildings and pavement. The design of stormwater management facilities and the way land is developed can significantly reduce nonpoint source pollutant loading which, in turn, will measurably affect the quality of our waterways. In addition to increased runoff as a result of development, nonpoint source pollutants can also come from: excess fertilizers, herbicides and insecticides from agricultural lands and residential areas; oil, grease and toxic chemicals from urban runoff and energy production; sediment from improperly managed construction; bacteria and nutrients from livestock, pet wastes, and faulty septic systems; and atmospheric deposition (emissions from power plants and motor vehicles)[8]. Nutrient runoff in the form of nitrogen and phosphorous is particularly problematic because it leads to increased algae growth (or algae blooms) which then die and decay, leading to large dead-zones in the Chesapeake Bay due to oxygen depletion.

From an ecological and a human health standpoint, all waterways are important. Our major water resource in Maryland is the Chesapeake Bay, however all the streams, creeks, and rivers leading to the Bay contribute to its overall health and water quality. This system of waterways is defined in terms of its respective watershed, which is the region draining into a river, river system, or other body of water. The Chesapeake Bay watershed includes a 64,000 square mile land mass within six states – Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia and all of Washington, D.C. The cumulative effect of this land mass and their waterways on the Bay is profound. On a local scale in Havre de Grace, the geographic relationship the City has with the Chesapeake Bay is immediate. The City lies directly on the shores of the northernmost Bay where the Susquehanna River opens up to the Susquehanna Flats and the Chesapeake itself. Portions of the City lie in the Harford County watersheds of the Lower Susquehanna and Swan Creek[9] which drain to the river and upper Bay and are shown on the watershed map included in this chapter. Because of the City's direct relationship to the Bay, Havre de Grace has additional environmental regulations – through the State's Chesapeake Bay Critical Area law – that modify land use and development immediately adjacent to the Bay.

[8] U.S. EPA website for polluted runoff (nonpoint source pollution)

[9] From Maryland 8-digit identified watersheds

This section of the Water Resources Element is important for describing the benefit of the various regulations relating to water quality. It includes the following subsections: stormwater management implementation, point and nonpoint source (NPDES) program implementation, sediment and erosion control, tributary strategy and reduction of nutrient impairment, flood control, and local options for nutrient reduction. Though tiny in comparison to the overall watershed at 5.4 square miles, Havre de Grace must adhere to all water quality programs and regulations. In addition, new initiatives at the federal level will be described briefly to show the focus at all levels of government for protecting and restoring the Chesapeake Bay.

Stormwater Management Implementation

Stormwater management is a method of controlling the quantity and quality of runoff from precipitation events in more densely developed areas. Historically and today, the State of Maryland is progressive in its stormwater management law, developing State regulations and requiring local ordinances for stormwater management. Stormwater management law drives the way land is developed or redeveloped and new road improvements are constructed. The need for stormwater runoff regulation is made forefront in this State due to years of effort in restoring the water quality of the Chesapeake Bay whereby land development practices are recognized as major contributors to the Bay's degradation. Ultimately statewide, the goal is to change land use practices through improved best management practices (such as construction of stormwater management) to make measureable improvements to the Bay's health and water quality.

To meet stormwater management law, Havre de Grace adopted its first ordinance in 1984 with the stated purpose to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding. New development was required to provide quantitative and qualitative control of stormwater runoff, with plans submitted and approved by the Director of Public Works. Grading and building permits could be suspended for infractions due to lack of progress or failures of stormwater management facilities. Minor amendments relating to fees were added to the original ordinance. In 2002, the City passed Ordinance No. 826 which was based on the State's model ordinance and the 2000 Maryland Stormwater Design Manual, Volumes I & II. This ordinance superseded prior stormwater management ordinances and revised its program relative to State requirements. Stormwater management facilities were designed to reduce impervious area by twenty percent (20%) of pre-development; provide best management practices (BMPs) that would treat water quality for twenty percent (20%); or a combination of impervious area reduction and the area treated by BMPs equal to twenty percent (20%) of the existing impervious area.

Best management practices, or BMPs, are "structural devices or nonstructural practices designed to temporarily store or treat stormwater runoff in order to mitigate flooding, reduce pollution, and provide other amenities".[10] They include stormwater management ponds and wetlands, infiltration and sand filter practices, bioretention facilities, open channels, filter strips and buffers. During the course of new development or redevelopment, stormwater runoff control must be designed and built into the landscape so that the runoff does not

[10] Maryland Model Stormwater Management Ordinance, June 2009

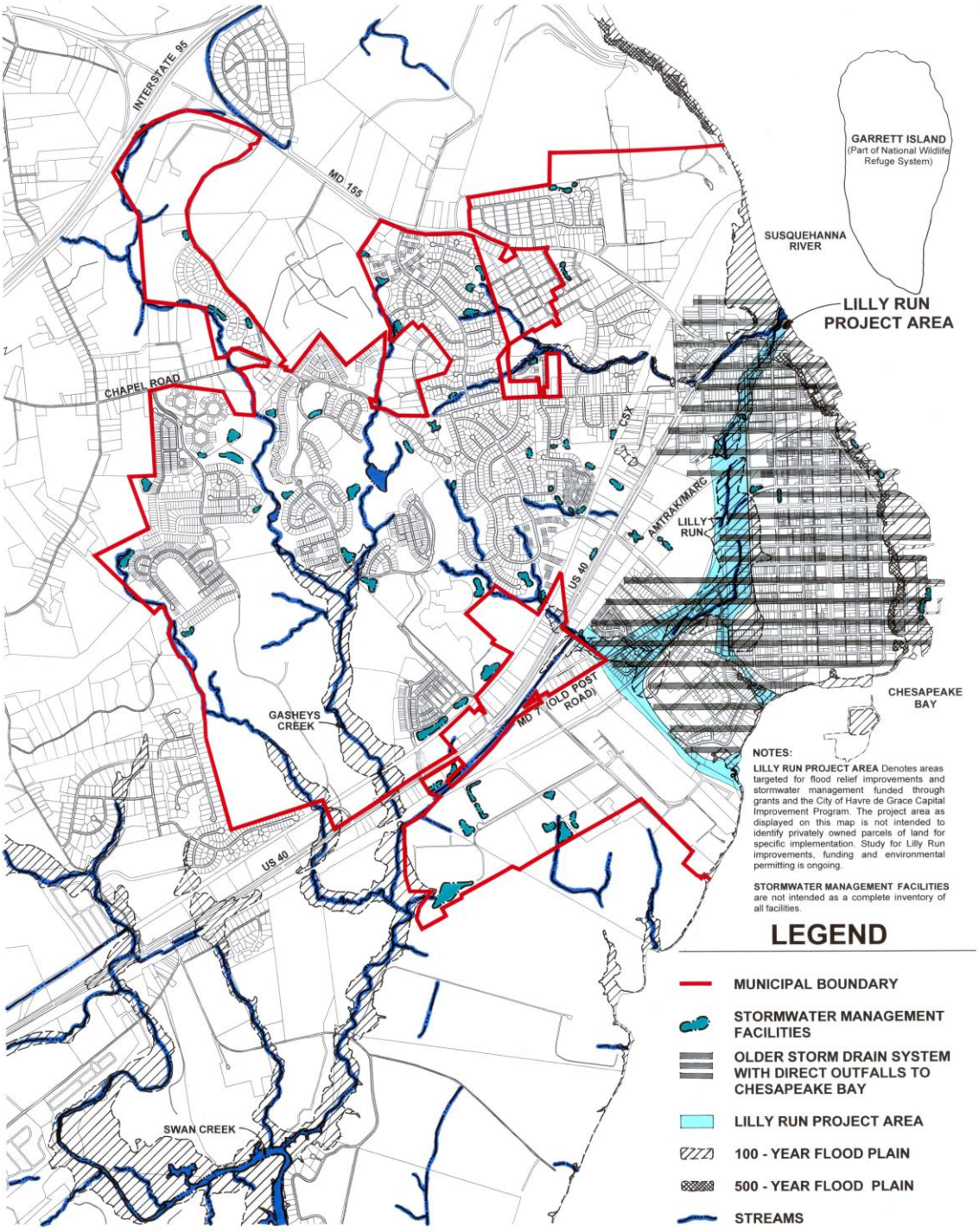
affect watercourses and adjacent or downstream properties. This is for both large-scale projects, like new multi-unit housing subdivisions or an industrial park, and smaller projects, like redevelopment of a quarter acre site in the middle of the city. Examples of BMPs in recent development in Havre de Grace include the stormwater management pond adjacent to Lewis Lane for the Havre de Hills townhouse development or (on the south side of US 40 on Lewis Lane) the underground filtration system that was built into the parking lot of the Havre de Grace Medical Center. Other ponds and stormwater management facilities have been built into development projects since the 1980's in the City for water quality and quantity benefits.

Most recently, the State of Maryland has again strengthened its water quality laws through implementation of The Stormwater Management Act of 2007. In these new regulations, developers are required to use state-of-the-art Environmental Site Design (ESD) wherever possible to control runoff and pollution from new development and to provide water quality treatment or impervious surface reduction by fifty percent (50%) for redevelopment[11]. As stated in the MDE press release (October 17, 2008), "[t]his comprehensive approach to reducing stormwater runoff and pollution uses a combination of enhanced site planning techniques, alternative permeable covers, vegetative buffers, and small-scale treatment practices to address the impacts associated with development." Local jurisdictions – counties and municipalities – in the State were to have adopted the new regulations by May 4, 2010. Havre de Grace met this deadline by passing its updated Stormwater Management Ordinance No. 912 on May 3, 2010 which took effect June 17, 2010.

Currently in Havre de Grace, there are over one hundred ten (110) stormwater facilities for which the City is responsible, either in terms of maintenance enforcement or direct ownership. These facilities include ponds, open swales, underground filtration systems, and outfall filters to name a few. All stormwater management facilities require regular maintenance and are inspected every two (2) years by Department of Planning – Inspection Services staff. In addition, Planning and Inspection Services staff members oversee the initial design, facility construction, and any sediment and erosion control conversion. The City also utilizes professional engineering consultants for technical plan review and required volume calculations for facility design. The new regulations also require a three-phase design review for stormwater management to include concept, site development, and final stormwater management plans.

Stormwater management is one aspect of environmental regulation that is considered in land development in Havre de Grace and within the State. Additional but related regulations exist for sediment and erosion control, development within a floodplain, and the Chesapeake Bay Critical Area Law. These laws are separate but related regulatory measures that interplay during the design and construction phases of development and redevelopment. Specific questions regarding these laws can be directed to the Department of Planning located at City Hall, 711 Pennington Avenue in Havre de Grace. Resource information and websites are also listed in Section IV of this chapter for additional reference.

[11] Maryland Department of the Environment Press Release, October 17, 2008



STORMWATER MANAGEMENT RESOURCES

City of Havre de Grace Comprehensive Plan

Point and Nonpoint Source (NPDES) Program Implementation

Federal law administered through the Environmental Protection Agency (EPA) directs State action for limiting pollution sources in waterways, whether its nonpoint or point sources. The Federal Clean Water Act was passed in 1972 to restore waters of the United States to fishable or swimmable conditions. Originally, it regulated point source discharges such as municipal and industrial wastewater discharges through NPDES (National Pollutant Discharge Elimination System) permit requirements. In 1987, Congress broadened the definition of point source to include industrial stormwater discharges and municipal separate storm sewer systems, which were divided into Phase I and Phase II for implementation. The City of Havre de Grace falls under Phase II requirements because of its small size (population less that 100,000), the rules of which came into effect in 2003. The City is required to participate in a five-year NPDES permit as a point source for its storm drain system as well as its stormwater management program which outlines a plan of action for reducing its contribution to pollutant loading in local waterways. Havre de Grace is covered under a general permit with over fifty other jurisdictions – towns, cities, and counties – of similar size within the State of Maryland.

The general permit for Phase II jurisdictions requires that each jurisdiction has a program in place to provide: public education and outreach; public participation and involvement; illicit discharge detection and elimination; construction site runoff control; post-construction runoff control; and pollution prevention and good house-keeping. To comply with these requirements, Havre de Grace has a program in place to meet each of the six requirements. Measures such as the City's intense street sweeping program, consistent oversight for stormwater management construction and maintenance, and sediment and erosion control enforcement are just a few of the major initiatives that the City performs to meet the requirements of the permit. In addition, City staff work with the public schools to educate students on the human effects on water quality and stencil storm drain inlets on a regular basis with "Chesapeake Bay drainage" to keep the general population informed as to how their respective actions contribute to overall Bay health. Like stormwater management, this program is administered through staff in the Department of Planning—Inspection Services.

For the purposes of NPDES, Havre de Grace is considered a point source for its storm drain collection system and series of stormwater management facilities. Point sources are individual sewage treatment plants, industrial wastewater systems, and urban and suburban stormwater systems. As covered in the wastewater collection and treatment system section of this chapter, the City also holds a separate permit for its point source pollutant discharge for the Havre de Grace Wastewater Treatment Plant. This permit caps, or limits, the amount of nutrient loading discharged directly into the Chesapeake Bay from that plant. Industrial discharge permits are required from separate industries located in City, such as J.M. Huber Corporation. As of 1991, NPDES permits are also required for construction activity under a general permit for stormwater associated with construction activity. Nonpoint source pollution, on the other hand, comes from many diffuse sources such as excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas, individual household septic systems, sediment from construction sites, and bacteria and nutrients from livestock and pet waste.

Sediment and Erosion Control

Sediment and erosion control law came into effect statewide in 1970, prior to stormwater management regulations which followed in the early 1980's. The intent of sediment and erosion control is to reduce the amount of soil (and thereby nutrients and sediment) that get into waterways as a result of land disturbance, largely through construction but also from agriculture and other practices. Sediment and erosion control plans are required for land disturbances greater than five thousand (5000) square feet or 100 cubic yards or more, which are reviewed and approved by the local Soil Conservation Districts through the Department of Agriculture. Upon approval, the City or other local jurisdiction provides a grading permit to respective applicants and provides inspection and enforcement.

The level of sediment and erosion control is dependent upon site characteristics and the amount of land disturbance, with the goal of keeping soil on the site with containment. For instance, simple sediment and erosion control practices may include placement of silt fences to retain soil on a site, temporary swales, or stabilized (stone) construction entrances to keep soil off of roadways as vehicles leave a construction site. Major projects may require sediment trapping devices (such as the construction of sediment basins) or significant land grading, such as re-grading the terrain into serrated slopes which are then stabilized with vegetation. Often in cases of land development, sediment basins were later converted to permanent stormwater management facilities to deal with post-development runoff volume. Due to the requirement of environmental site design to the maximum extent possible, the permanent creation of stormwater management ponds may be greatly diminished.

Tributary Strategy and Reduction of Nutrient Impairment

Maryland's Tributary Strategy is an initiative to substantially reduce human-made impacts to the Chesapeake Bay and its many tributaries and to make measurable improvements to water quality. The Tributary Strategy Program has been in place since the 1992 Amendments to the Chesapeake Bay Agreement, which was first signed in 1983 by the U.S. Environmental Protection Agency, the Chesapeake Bay Commission, the District of Columbia, and the States of Pennsylvania, Maryland, and Virginia. This interstate agreement established specific nutrient reduction targets for the watersheds of each of the Bay's major tributaries. Most recently, the Chesapeake Bay 2000 Agreement committed its signatories to the latest science and established greater reductions in nitrogen and phosphorous in an effort to restore the Bay. A statewide implementation plan was developed in 2008 with specific strategies and timelines outlined for meeting set goals[12].

The *Maryland's Chesapeake Bay Tributary Strategy Implementation Plan* sets the framework for the State and all local jurisdictions for achieving set targets to meet and maintain nutrient reduction goals, outlining both point and nonpoint source strategies. These targets include the construction of 47 ENR wastewater treatment plants in the State by 2010 (with Havre de Grace being one) using the Bay Restoration Fund established in 2004. The combined flow of the State's significant wastewater treatment plants (those with a design capacity greater than 500,000 gallons per day) comprise 95% of the total sewage flow generated in Maryland. In addition, the plan outlines strategies and specific

[12] Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan, January 24,2008

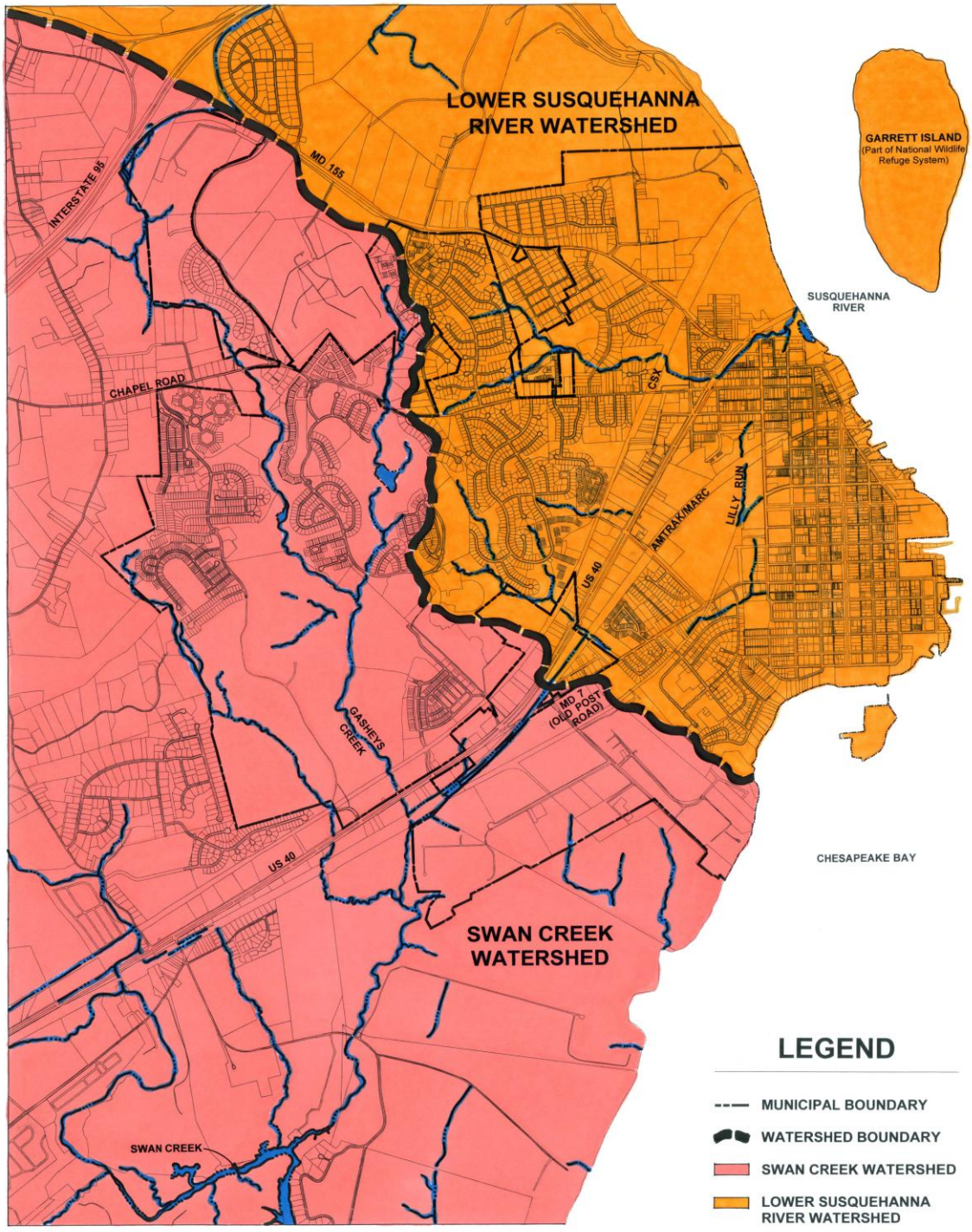
implementation targets for stormwater, onsite sewage disposal, growth management, agriculture, and air deposition.

The Tributary Strategy is related to TMDLs (Total Maximum Daily Loads) which have a basis in regulation and regulatory action, such as more restrictive permits. Complimentary to TMDLs, Tributary Strategy is a cooperative implementation program as opposed to strictly regulatory. TMDLs define set limits for nutrients and other pollutants for individual tributaries which are identified as impaired. A list of impaired waters is commonly referred to as the "303(d) list" for the section of the federal Clean Water Act and U.S. Environmental Protection Agency regulations in which it references. At this point in time, TMDLs are applied to tributaries, such as nearby Swan Creek, which had a TMDL applied for nutrient loading. In the future, it is anticipated that a TMDL will be applied to the Chesapeake Bay in its entirety, commonly referred to as a "pollution diet". Nutrient loading limits will be allocated to individual states comprising the Bay's watershed and then subsequently divided among the local jurisdictions – counties, cities, and towns.

As a point of reference in this broader regional picture, Havre de Grace is divided between the Lower Susquehanna River and Swan Creek watersheds and, respectively, between the larger Susquehanna and Upper Western Shore basins. Both the Lower Susquehanna River and Swan Creek have been identified as impaired. Due to high nutrient loads in Swan Creek, a TMDL was developed by MDE in 2002 for nitrogen and phosphorous[13]. TMDLs for Swan Creek were established for low-flow (May – October) and average annual flow conditions, which limit point source discharge of the Aberdeen and the Swan Harbour Dell wastewater treatment plants. In addition, the document addresses contributing nonpoint sources of agriculture and the continued monitoring of the stream quality through Harford County's Phase I NPDES Stormwater Permit and the City of Aberdeen's Phase II NPDES Stormwater Management Permit. A study of the Lower Susquehanna River in 2005 did not require a TMDL for nutrient loading at that time; however other impairments are to be addressed at a future date[14]. As part of the Swan Creek watershed, Havre de Grace must ensure that land use practices do not further contribute to nutrient loading of Swan Creek and must recognized the need for stormwater runoff recapture for Bulle Rock Golf Course and the residential developments of Bulle Rock, Scenic Manor, and Greenway Farm.

[13] See Total Maximum Daily Loads of Nitrogen and Phosphorous for Swan Creek, Harford County, Maryland. January 28,2008

[14] Water Quality Analysis of Euthrophication for the Tidal Lower Susquehanna River, Harford and Cecil Counties, Maryland. June 24, 2005



WATERSHED MAP

City of Havre de Grace Comprehensive Plan

Flood Control

As a coastal city, Havre de Grace is subject to significant flooding. Many factors contribute to this – an extensive shoreline, exposure to extreme weather from easterly and southerly directions, many substantial tributaries, ditches, and waterways in the coastal plain, increased development, and a major hydro-electric dam eight miles up-river which at times releases great volumes of water requiring notification to downstream communities. Major flooding has happened along the shoreline as with Hurricane Isabel in 2003 storm surge or interior to the City due to heavy rain event such as with Hurricane Floyd in 1999 or, most recently, the unnamed storm on July 12, 2004. Historically, other flood events included Hurricane Agnes in 1972, which left Maryland devastated and the submerged aquatic vegetation (SAVs) in the Susquehanna Flats decimated. In a worst-case scenario, a tidal surge and flood rains could occur in a single event where a major section of old town becomes cutoff and residents on the waterfront forced to leave homes without emergency evacuation options.

Because of the recurring threat to public safety and property, the City has undertaken a series of studies to identify specific measures to reduce the impacts of flooding and provide for emergency access to the older portions of town. The focus of the study has been on the interior portions of the City which are part of the floodplain associated with Lilly Run and its tributaries. Historic changes to topography through massive re-grading for transportation systems (such as the AMTRAK, formerly Pennsylvania Railroad), altered watercourses, channelization, undersized culverts, and new development all contribute to the interior flooding problem in severe rain events. The City's geography relative to the fall line (which demarcates coastal and higher piedmont regions) and the topography of its contributing watershed are factors in the severe flood recurrence. Engineering studies to alleviate flooding date as far back as 1966, but it was a documented problem well before then.

The most recent study was performed by URS Corporation in 2007, identifying priorities and providing cost estimates for improvements. This engineering firm has been retained for continued implementation of the *Lilly Run Improvement Plan* and submitted a Joint Federal/State Application Permit[15] in March 2010 for constructing several flood relief projects. The priority for these flood relief efforts are for public safety – to provide emergency access into the older portions of the City which include several fire stations, the Havre de Grace Police Department and City Hall, and Harford Memorial Hospital as well as a dense residential and commercial area. In addition, the protection of public and private property from damage, expedited floodwater exit, water containment, and environmental enhancements are all part of the overall strategy to address flood impacts.

The permit application review for the multi-tiered project is anticipated to take eight months to a year to complete. In that time, City staff and the consulting engineers are identifying funding sources and prioritizing implementation projects that can move forward independently. More detailed construction drawings may also be required for some segments of the plan. A generalized boundary of the project area is included in the

[15] Full title: Joint Federal/State Application for the Alteration of any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland.

Stormwater Management Resources Map located in this chapter. Please see the *Lilly Run Improvement Plan* for more specific information.

Any new development or structures within a floodplain are required to meet additional construction standards to withstand flood events. Such requirements include the elimination of living/occupied space, plumbing fixtures, and mechanical/electrical fixtures (as measured to specific heights above mean high water) and installation of breakaway panels and flood vents for enclosures in the flood areas. All structures within a floodplain also require MDE approval, including fences and sheds. The City has recently implemented the voluntary Community Rating System in Havre de Grace for reduced flood insurance premiums for residents of flood-prone properties. First certified in 2009 with a Class 9 rating, staff members are continuing to reduce flood insurance rates through a points/percentage system through FEMA and the Insurance Service Office, Inc. (ISO). Each decrease in rating steps results in a five percent reduction in flood insurance for policyholders in the community. Please see identified floodplain on authoritative FEMA (Federal Emergency Management Agency) maps for locating affected properties within the floodplain. The City also outlines alternative emergency operations in its 2009 Havre de Grace Continuity of Operations Plan (COOP) for disaster planning, to include flood emergencies.

Local Options for Nutrient Reduction

The goal of stormwater management and NPDES programs is for nutrient reduction, which is the decrease of nitrogen and phosphorous in our waterways – nutrients which come from both nonpoint and point sources. As mentioned prior, nutrient-filled runoff leads to increased algae growth which then die and decay, causing large dead-zones in the Chesapeake Bay from oxygen depletion. The passage of new stormwater management regulations in Maryland for better site design and redevelopment requirements will provide automatic reductions in nutrient loading from nonpoint sources throughout the State. The new regulations will be applied to all new development projects or major redesign of existing projects with the City of Havre de Grace. In addition, new regulations for allowable wastewater treatment plant nutrient loads have been mandated, so overall nutrient loads in the Bay from point sources will be reduced, even as new development occurs.

A requirement of the HB1141 Water Resources Element is to provide nonpoint source nutrient loading analysis at the local level. In the case of Havre de Grace, as with many small jurisdictions, the analysis is limited. In addition, the opportunity for various scenarios for future development is also limited. Most of the City's major development projects are known and approved, to include site plans with lot layout, road network, and finalized stormwater management plans. Substantial changes to existing site plans would require new stormwater management design which would automatically lead to nutrient reduction. Projects with site plan approval include The Residences at Bulle Rock, Greenway Farms, and Scenic Manor. For any future development projects that do not have site plan and sediment and erosion control plan approval, new stormwater management regulations will be applied which would require environmental site design to the maximum extent possible.

Nutrient loading analysis requires that jurisdictions understand known impervious surface quantities by land use, which leads to the understanding of nutrient loading quantities, and then develop scenarios for alternate land uses and improved best management practices. Utilizing data from 2004 provided by Harford County Government, Table 6.3 shows the various acreage of land use by category within the City. Taking that data a step farther, Table 6.4 shows impervious surface calculations by acreage and 2004 land use using established rates of imperviousness provided by MDE.

TABLE 6.3
HAVRE DE GRACE LAND USE ACREAGES BY CATEGORY

2004 Land Use	Acreage	Percent of Total Area
Low Density Residential	248	7.2%
Medium Density Residential	680	19.6%
High Density Residential	395	11.4%
Commercial	294	8.5%
Industrial	179	5.2%
Institutional	389	11.2%
Open Urban	25	0.7%
Transportation/Rights-of-way	26	0.8%
Large Lot Subdivision	20	0.6%
Undeveloped[16]	1,208	34.5%
Total Acreage	**3,464**	100%

Source: Harford County Government (Department of Public Works, Water Resources Division)

TABLE 6.4
IMPERVIOUS SURFACE CALCULATIONS FOR HAVRE DE GRACE BY 2004 LAND USE CATEGORIES

Land Use	Acreage	Impervious Rate	Impervious Acreage
Low Density Residential	248	0.14	34.72
Medium Density Residential	680	0.28	190.40
High Density Residential	395	0.41	161.95
Commercial	294	0.72	211.68
Industrial	179	0.53	94.87
Institutional	389	0.34	132.26
Open Urban	25	0.09	2.25
Transportation/Rights-of-way	26	0.95	24.70
Large Lot Subdivision	20	0.04	0.80
Undeveloped	1,208	0.00	0.00
Total	**3,464**	**0.246**	**853.63**

Source: Harford County Government (Department of Public Works, Water Resources Division) for acreages and Maryland Department of Environment for impervious surface rates

Though a small jurisdiction, Havre de Grace is located in both the Susquehanna BFL (below fall line) and Western BFL basins. Each land use category has a level of measureable nutrient loading based on pounds per acre of impervious and pervious surface, and nitrogen and phosphorous amounts are calculated separately. Any analysis is based on the types of BMPs used and by watershed – no easy task. As prescribed by the State for the development of the Water Resources Element, 2002 BMPs and Tributary Strategy

[16] 28 acres of this total not available for development, wetland (8 acres) and water (20 acres) included here.

Implementation are to be utilized with a baseline of current land use (in this case, 2004 from Harford County Government) and projected land use for 2025. As an example, low density residential land in the Susquehanna Basin BFL has a 10.61 lbs/acre/year for pervious surfaces and 8.25 lbs/acre/year for impervious surfaces for nitrogen using 2002 BMPs. Calculated to its fullest extent, the 248 acres of Low Density Residential in Havre de Grace produces 2,653 lbs/year/area of nitrogen and 268 lbs/year/acre of phosphorous.

Based on 2004 land use and pervious and impervious calculations, Havre de Grace contributes close to 24,000 pounds of nitrogen and 2,000 pounds of phosphorous per year from nonpoint sources[17]. In addition, the wastewater treatment plant with past BNR processes contributed 28,567 pounds of nitrogen and 2,783 pounds of phosphorous in year 2009. Combined, this shows a base level of the City contributing over 50,000 pounds of nitrogen and close to 5,000 pounds of phosphorous per year of total nutrient loading. In contrast, future land use practices and improved best management practices will reduce the City's nutrient loading from nonpoint source runoff. Most striking, however, is the anticipated nutrient reduction with the operation of ENR at the wastewater treatment plant. With ENR in effect, the City's wastewater treatment plant is now expected to contribute less that 9,000 pounds per year total nitrogen and 720 pounds per year total phosphorous, based on its first three months of efficient operation (February, March, and April, 2010).

In future analyses, the City would like to be included in the Harford County Water Resource Element which will allow for a watershed focus, especially with regard to future TMDLs and the continued need for regional watershed planning. However, it is beneficial to capture the City's nutrient load separately, just to understand the impact to water quality of the Bay at a smaller scale as well. This local focus may be more meaningful to individual citizens and to City officials for understanding the collective role that smaller municipalities play in the health of the Chesapeake Bay.

Potential mitigation projects to meet future nutrient reduction requirements and water quality goals may include the following:

1. Portions of the Lilly Run Improvement project which have environmental enhancements appropriate for mitigation funding, such as storm drain outfall filters, in-stream stormwater management pond with water quality benefits, native planting and reforestation
2. Grass filter strips or bio-retention areas along waterfront municipal parking areas, including the Havre de Grace yacht basin parking
3. Outfall filters for direct outfalls (22) for old town storm drain system
4. Innovative stormwater filtration or bio-retention in park-like setting behind Citizen's Care Center
5. Continued community education for conservation, yard planting guidance, rain barrel construction, and pet waste impact on nutrient loading
6. Opportunities for retrofitting small bio-retention areas at private commercial

[17] Actual calculation is 23,731 pounds per year of nitrogen and 1,921 pounds per year of phosphorous based on 2004 land uses.

development

7. Environmental restoration along shoreline, where possible
8. Homeowners association education and assistance with stormwater management pond maintenance
9. Potential nutrient offloading from wastewater treatment plant to Bulle Rock Golf Course to replace use of fertilizers for grounds maintenance and provide irrigation

Federal Strategy for Protecting and Restoring the Chesapeake Bay

Increased restoration efforts for the Chesapeake Bay are going forward at the federal level. On May 12, 2009, President Obama issued the first presidential directive on the Chesapeake Bay and the first Executive Order of the Obama Administration on the environment.[18] Calling the Bay a "national treasure", the purpose of the Executive Order is "to protect and restore the health, heritage, natural resources, and social and economic value of the nation's largest estuarine ecosystem and the natural sustainability of its watershed". It acknowledges the need for a strong federal leadership role in the restoration of the Bay, but it also states that its success is dependent on a collaborative effort of state and local governments, the private sector, nonprofit organizations, and the region's residents.

In the *Executive Order 13508 Draft Strategy for Protecting and Restoring the Chesapeake Bay*, the focus of the strategy is to restore clean water; conserve treasured places and restore habitats, fish, and wildlife; and to adapt to the impacts of climate change. These actions are to be achieved through three primary means: empower local efforts; decision-making through science; and a new era of federal leadership. Specific actions are also stated in the *Draft Strategy*. One of the main strategies is to develop a Chesapeake Bay TMDL for nutrient loading for all six watershed states and the District of Columbia. It is expected that the EPA will establish this bay-wide TMDL in December 2010 and will be a key to improving overall water quality by requiring accountability for individual State and local jurisdiction nutrient loading.

To meet the Chesapeake Bay 2000 Agreement and Federal Clean Water Act, nutrient loading must be cut in half from year 1985 levels from all sources. For Maryland, the allocation cap is set at 37.25 million pounds of nitrogen and 2.92 million pounds of phosphorous per year. Maryland's Tributary Strategy provides the framework for achieving bay restoration and nutrient reduction goals, with 2-year, 5-year, and long-term initiatives that are realistic and attainable[19], actions which include ENR upgrades to wastewater treatment plants that Havre de Grace has attained. In addition, local governments must examine land use policy to minimize impacts to water quality and incorporate bay restoration efforts into capital and operating budgets to support nutrient reduction goals. As part of the growth area of Harford County, it is very important that the City of Havre de Grace participates in subsequent watershed implementation plans for meeting nutrient loading caps, so that the City may plan and fund projects that mitigate nutrient loading to meet future Chesapeake Bay TMDL requirements.

[18] From Executive Order 13508, Draft Strategy for Protecting and Restoring the Chesapeake Bay. November 9, 2009. Developed by the Federal Leadership Committee for the Chesapeake Bay

[19] Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan. January 24, 2008

VI. SUPPORTING RESOURCES

The City maintains technical documentation for city services relating to water supply, wastewater treatment, stormwater management and non-point source program implementation. The following is a list of major sources of information for the development of this Water Resources chapter and other supporting documentation for further inquiry. Please contact the City of Havre de Grace Department of Planning or Department of Public Works, Harford County Department of Public Works Water and Sewer Division, the Maryland Department of the Environment or other agencies for more specific information regarding Havre de Grace described in this Water Resources chapter.

Water Supply Capacity Management Plan – required yearly by Maryland Department of the Environment Water Management Administration to show available capacity of water treatment plant to serve current and future planned needs for public water supply.

Water Allocation Permit: HA1971S004 (05) for Havre de Grace Water Treatment Plan. Intake point: Susquehanna River. Water Allocation Permit administered through the Maryland Department of the Environment Water Management Administration.

Annual Drinking Water Quality Reports: PWSID #0120012 (Public Water Source Identification Number) required annually by federal Environmental Protection Agency for potential contaminant levels, source of contaminants, turbidity, and treatment techniques.

Wastewater Capacity Management Plan – required yearly by Maryland Department of the Environment Water Management Administration to show available capacity of wastewater treatment plant to serve current and future planned needs for wastewater disposal.

Wastewater Discharge Permits: State Discharge Permit Number: 06-DP-0673, NPDES Discharge Permit Number: MD0021750 for Havre de Grace Wastewater Treatment Plant. Discharge point: Chesapeake Bay. (NPDES; National Pollutant Discharge Elimination System administered through Maryland Department of the Environment).

General Permit for Discharges from Small Municipal Separate Storm Sewer Systems, NPDES (Phase II): General Discharge Permit Number: 03-IM-5500, General NPDES Permit Number: MDR055500.

Harford County Water and Sewer Master Plan – formally adopted by Harford County Council spring and fall of each year and also includes the basis for water and sewer planning for the municipalities of Havre de Grace, Aberdeen, and Bel Air.

Ordinance No. 912, Stormwater Management (Chapter 169, General Code eCode360, City of Havre de Grace, MD), formerly Ordinance No.826 Stormwater Management from 2002.

Ordinance No. 654, Subdivision of Land (Chapter 173, General Code eCode360, City of Havre de Grace, MD)

Ordinance No. 718 and 769, Site Plan Approval (Chapter 155, General Code eCode360,

City of Havre de Grace, MD)

Ordinance No. 896, Establishment of Water and Sewer Commission (Chapter 25, General Code eCode360, City of Havre de Grace)

List of Development Activity: Individual Projects/Subdivisions. Status as of January 1, 2010. See Residential Development Capacity in Municipal Growth Element, Addendum B.

V. APPENDIX

A. Point Source Nutrient Loading from Wastewater Treatment Plant

The following table shows the nutrient loads pounds per year for the City's wastewater treatment plant utilizing Biological Nutrient Removal (BNR) processes, improvements which were completed in 2002.

Year	Total Nitrogen (TN) lbs./year	Total Phosphorous (TP) lbs./year
2002	38,372	3,187
2003	36,636	2,396
2004	34,527	3,714
2005	34,772	2,410
2006	31,776	2,464
2007	35,292	2,531
2008	29,891	2,862
2009	28,567	2,783

This table shows monthly nutrient loads for the Enhanced Nutrient Removal (ENR) wastewater treatment facility, improvements which were completed in December 2010 to meet Bay Restoration requirements. Data from the month of January is not included in the averages due to systems calibration.

Month	Total Flow, million/gallons	Average ppm*/TN	Total TN lbs/month	Average ppm*/TP	Total TP lbs/month
January	38.1	5.60	1,782.2	0.33	106.1
February	40.9	2.17	738.8	0.19	63.1
March	52.2	2.15	937.2	0.23	98.7
April	39.8	1.7	567.1	0.06	18.2

*parts per million

B. Nutrient Loading for 2004 and 2025 Land Use Scenarios

The following tables provide information of the City's nutrient loads based on watershed factors provided by Maryland Department of the Environment, impervious surface rates, acreage by land use, and future land use. This information supports text in the ***Nutrient Reduction*** section of this Water Resources Element

and is consistent with the methodology of the Harford County Natural Resources Element (which incorporates their respective Water Resources Element). This information has been provided by Harford County Department of Public Works, Water Resources Division.

[Information from Harford County Department of Public Works, Water Resources Division to be included in final draft]

[NOTE: THIS CHAPTER WAS FORMERLY THE PUBLIC UTILITIES CHAPTER ADOPTED IN THE 2004 HAVRE DE GRACE COMPREHENSIVE PLAN. THIS WATER RESOURCES CHAPTER AMENDMENT IS A RESULT OF REQUIREMENTS OF HB 1141 FROM 2006 AND REPLACES THE FORMER CHAPTER IN ITS ENTIRETY.]